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(54) **FIBRE CHANNEL GATEWAY SYSTEM**

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(51) **Int. Cl.**

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H04L 29/06	(2006.01)
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H04L 12/931	(2013.01)
H04L 29/08	(2006.01)

(52) **U.S. Cl.**

CPC ***H04L 69/08*** (2013.01); ***H04L 41/0226*** (2013.01); ***H04L 67/1097*** (2013.01)

(58) **Field of Classification Search**

CPC H04L 41/0226; H04L 69/08

See application file for complete search history.

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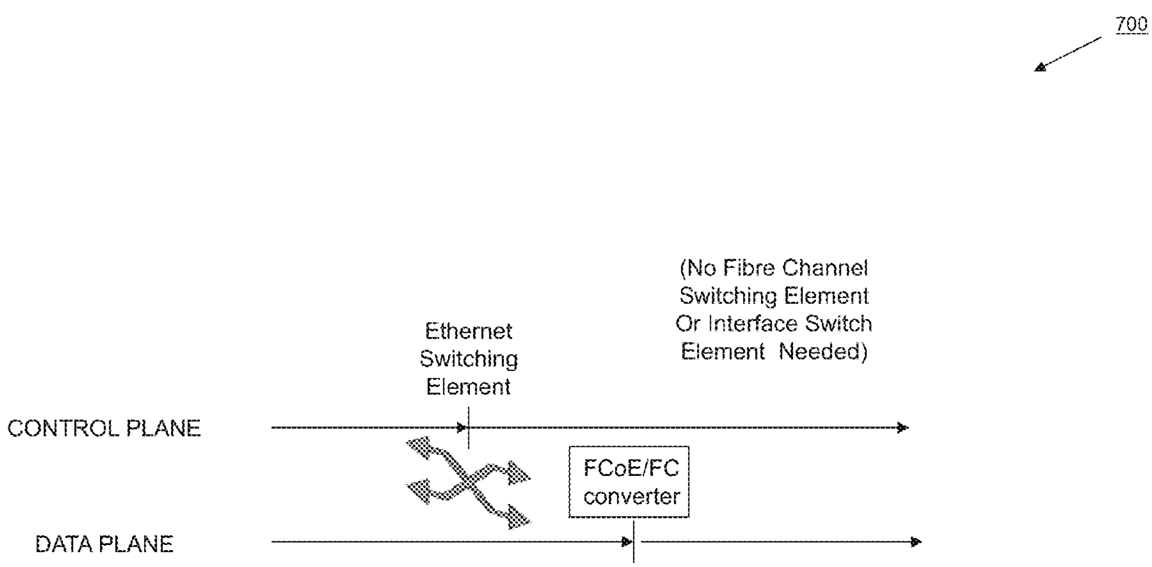
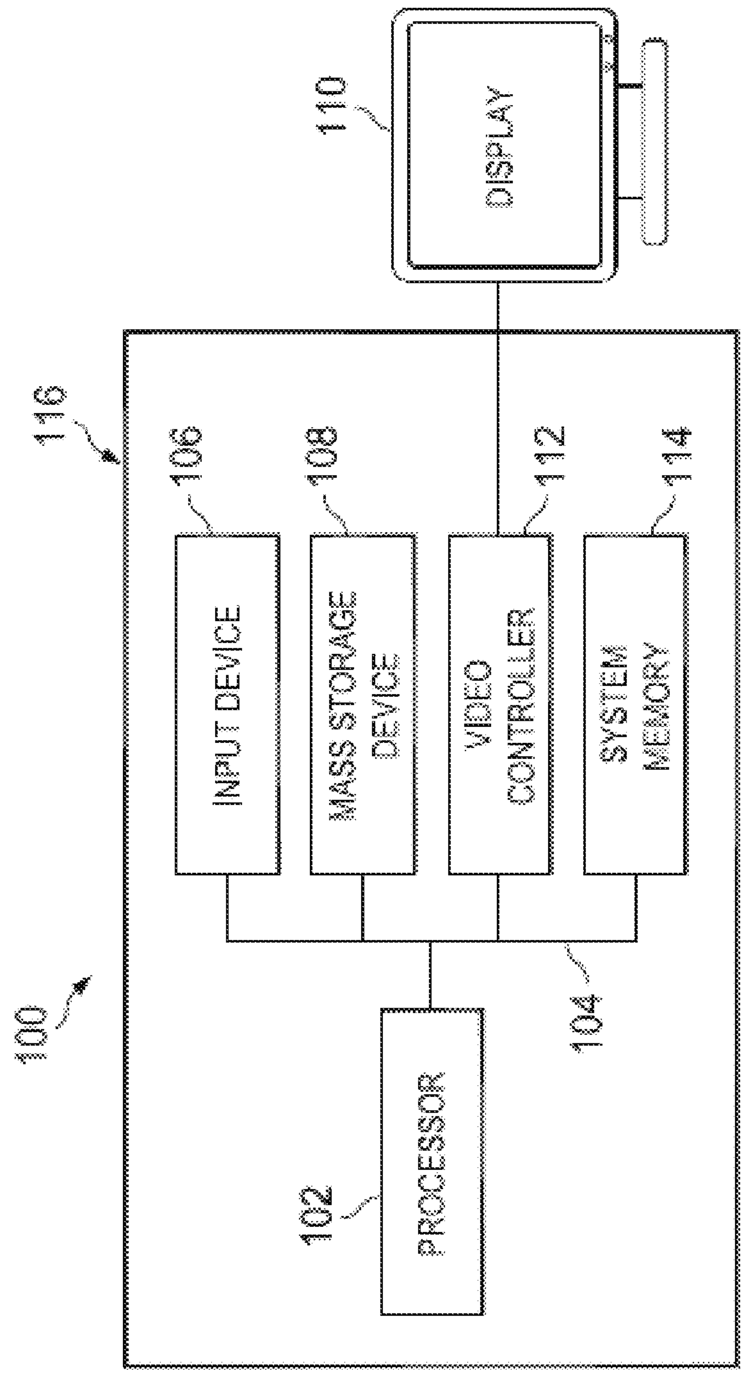
(57) **ABSTRACT**

An information handling system (IHS) network includes a server IHS and a Fiber Channel (FC) switch IHS that are each directly connected a FC gateway. The FC gateway is configured to establish communication with the FC switch IHS. The FC gateway then receives one of an FCoE Initialization Protocol (FIP) fabric login message and a FIP fabric discovery message from the server IHS and, in response, provides a FCoE fabric discovery message and converts the FCoE fabric discovery message to an FC fabric discovery message that is provided to the FC switch IHS. The FC gateway also receive a FC fabric discovery accept message from the FC switch IHS, converts the FC fabric discovery accept message to an FCoE fabric discovery accept message, and provides one of a FIP fabric login accept message and a FIP fabric discovery accept message to the server IHS.

17 Claims, 8 Drawing Sheets




100
116
106
INPUT DEVICE
108
MASS STORAGE DEVICE
112
VIDEO CONTROLLER
114
SYSTEM MEMORY
110
DISPLAY
102
PROCESSOR
104

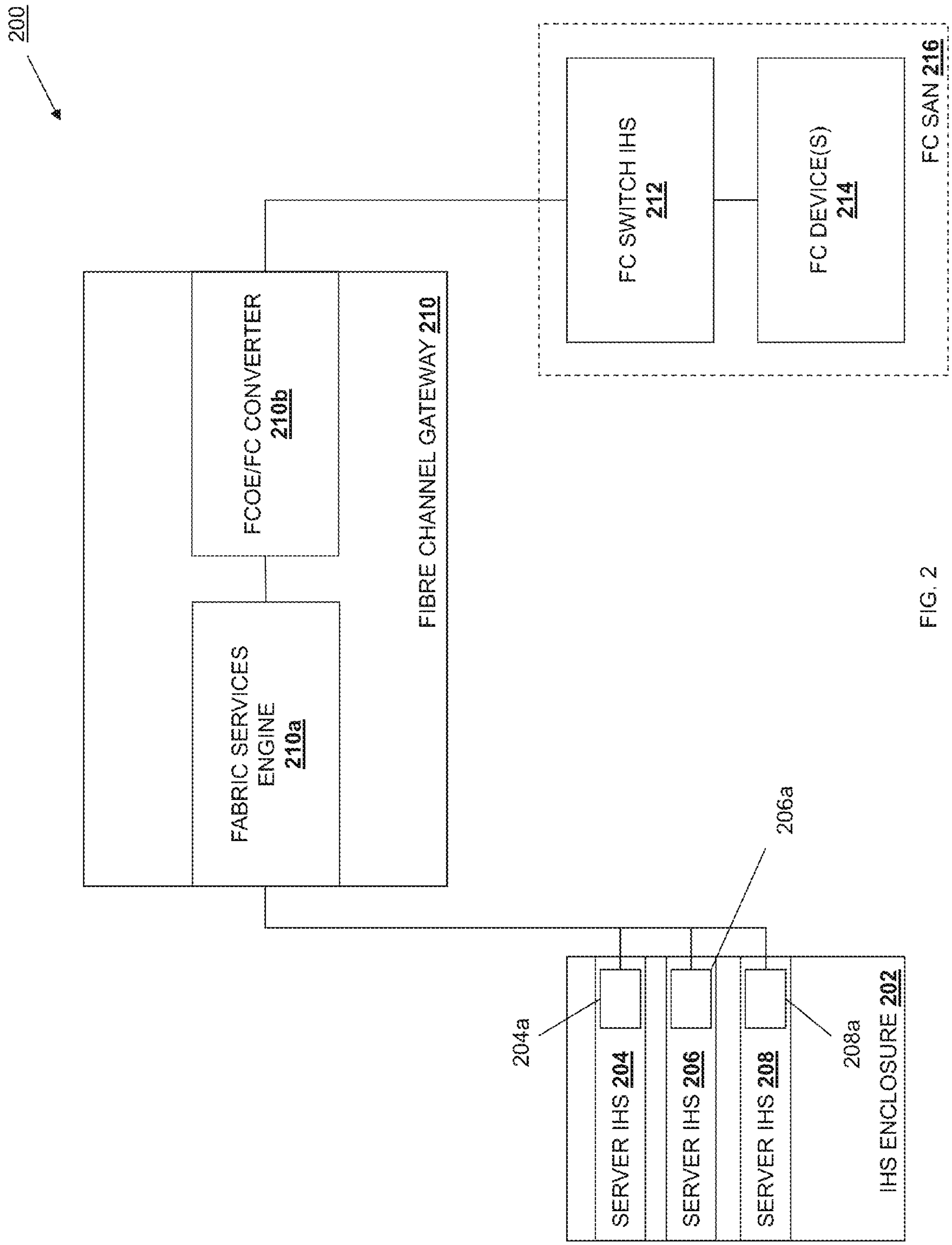

200
FC SWITCH IHS 212
FC DEVICE(S) 214
FC SAN 216
FCOE/FC CONVERTER 210b
FABRIC SERVICES ENGINE 210a
FIBRE CHANNEL GATEWAY 210
206a
204a
208a
SERVER IHS 204
SERVER IHS 206
SERVER IHS 208
IHS ENCLOSURE 202

FIG. 2

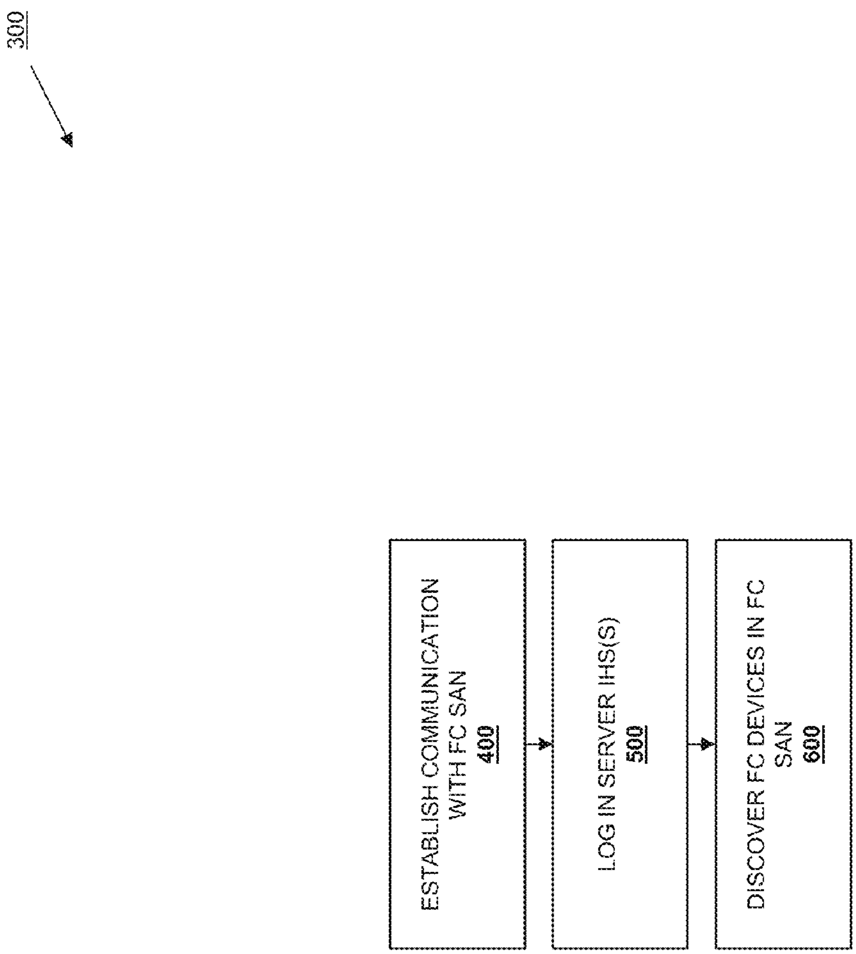

300
ESTABLISH COMMUNICATION WITH FC SAN
400
LOG IN SERVER IHS(S)
500
DISCOVER FC DEVICES IN FC SAN
600

FIG. 3

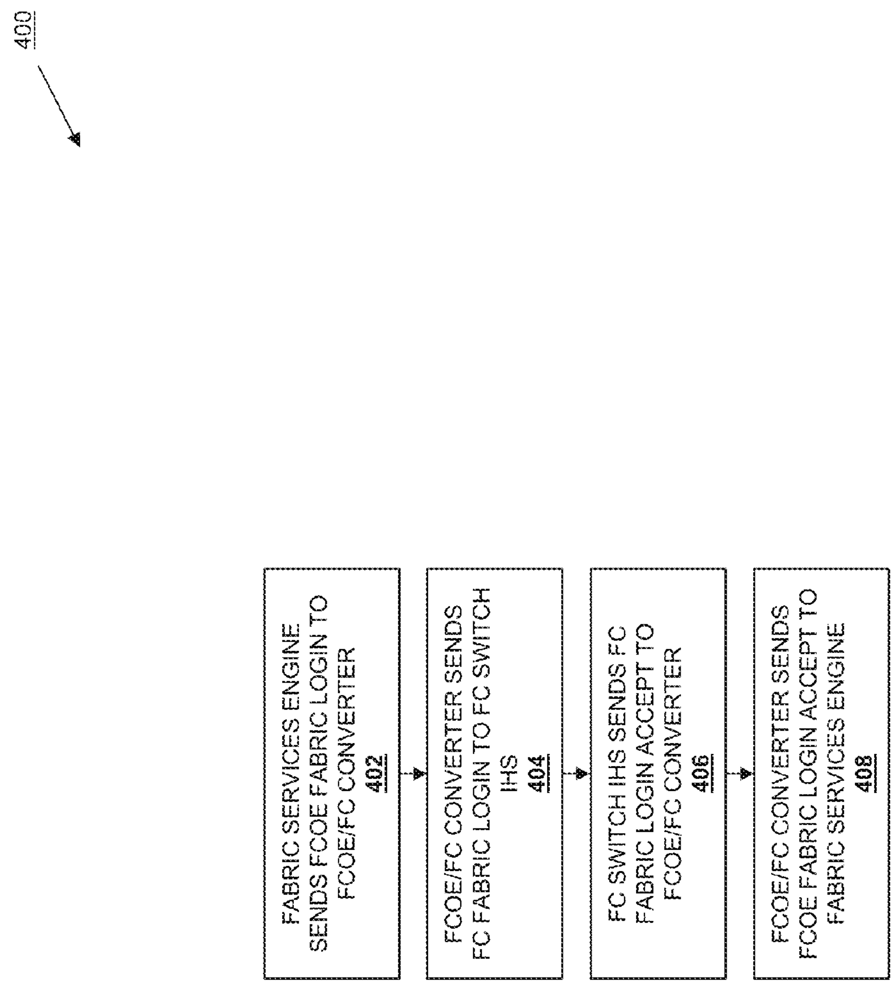

400
FABRIC SERVICES ENGINE SENDS FCOE FABRIC LOGIN TO FCOE/FC CONVERTER 402
FCOE/FC CONVERTER SENDS FC FABRIC LOGIN TO FC SWITCH IHS 404
FC SWITCH IHS SENDS FC FABRIC LOGIN ACCEPT TO FCOE/FC CONVERTER 406
FCOE/FC CONVERTER SENDS FCOE FABRIC LOGIN ACCEPT TO FABRIC SERVICES ENGINE 408

FIG. 4

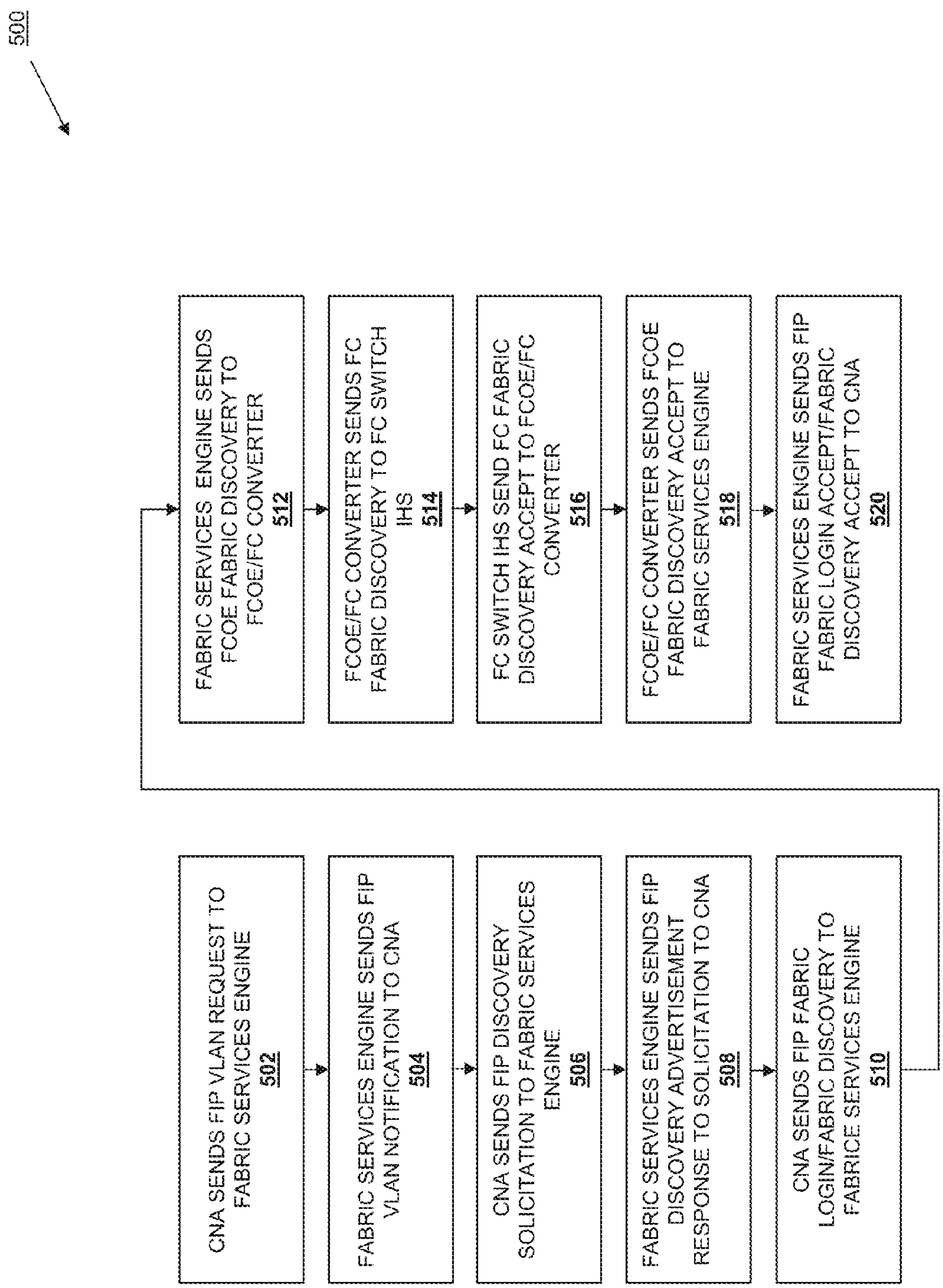

500
CNA SENDS FIP VLAN REQUEST TO FABRIC SERVICES ENGINE
502
FABRIC SERVICES ENGINE SENDS FIP VLAN NOTIFICATION TO CNA
504
CNA SENDS FIP DISCOVERY SOLICITATION TO FABRIC SERVICES ENGINE
506
FABRIC SERVICES ENGINE SENDS FIP DISCOVERY ADVERTISEMENT RESPONSE TO SOLICITATION TO CNA
508
CNA SENDS FIP FABRIC LOGIN/FABRIC DISCOVERY TO FABRICE SERVICES ENGINE
510
FABRIC SERVICES ENGINE SENDS FCOE FABRIC DISCOVERY TO FCOE/FC CONVERTER
512
FCOE/FC CONVERTER SENDS FC FABRIC DISCOVERY TO FC SWITCH IHS
514
FC SWITCH IHS SEND FC FABRIC DISCOVERY ACCEPT TO FCOE/FC CONVERTER
516
FCOE/FC CONVERTER SENDS FCOE FABRIC DISCOVERY ACCEPT TO FABRIC SERVICES ENGINE
518
FABRIC SERVICES ENGINE SENDS FIP FABRIC LOGIN ACCEPT/FABRIC DISCOVERY ACCEPT TO CNA
520

FIG. 5

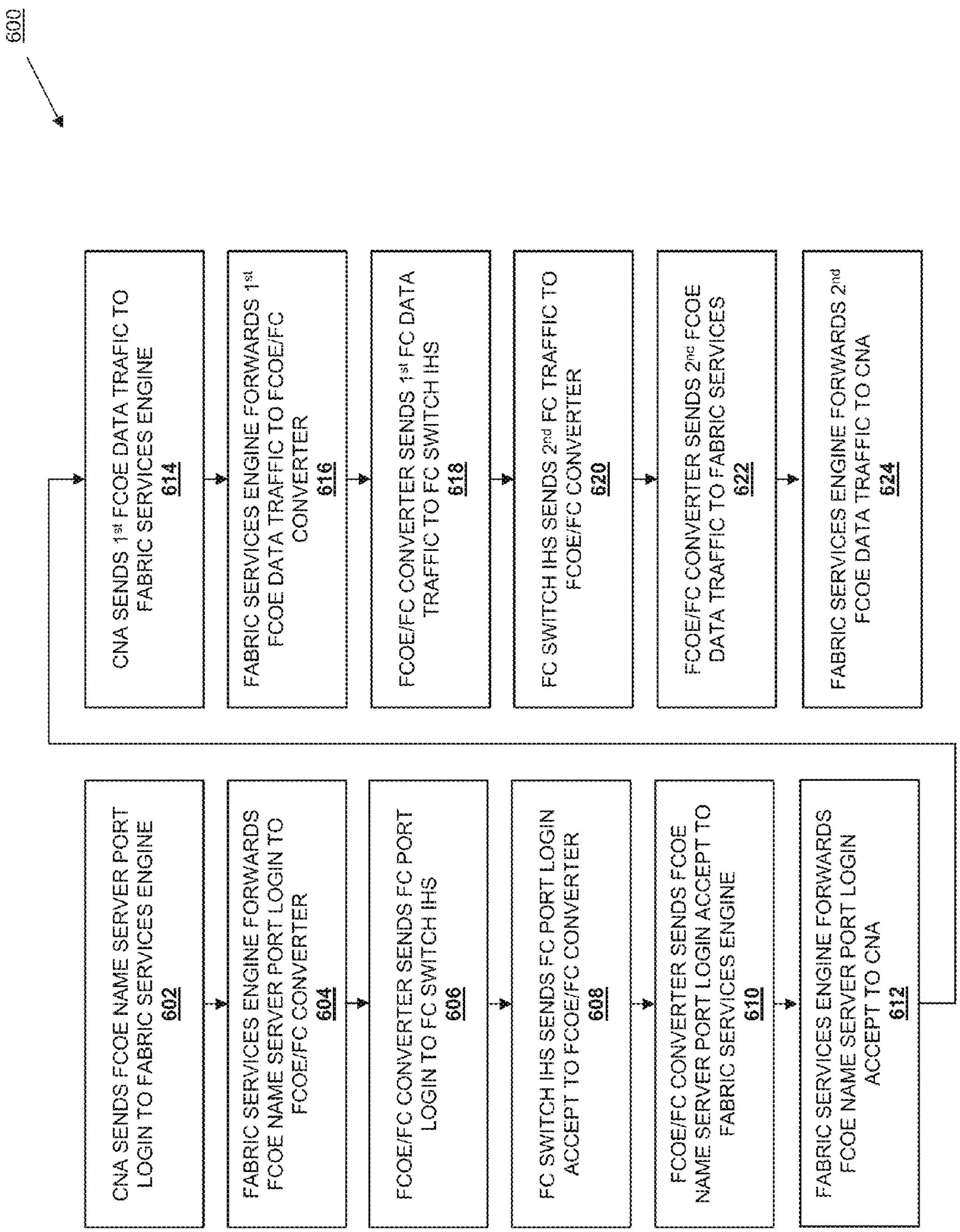

600
CNA SENDS FCOE NAME SERVER PORT LOGIN TO FABRIC SERVICES ENGINE 602
FABRIC SERVICES ENGINE FORWARDS FCOE NAME SERVER PORT LOGIN TO FCOE/FC CONVERTER 604
FCOE/FC CONVERTER SENDS FC PORT LOGIN TO FC SWITCH IHS 606
FC SWITCH IHS SENDS FC PORT LOGIN ACCEPT TO FCOE/FC CONVERTER 608
FCOE/FC CONVERTER SENDS FCOE NAME SERVER PORT LOGIN ACCEPT TO FABRIC SERVICES ENGINE 610
FABRIC SERVICES ENGINE FORWARDS FCOE NAME SERVER PORT LOGIN ACCEPT TO CNA 612
CNA SENDS 1st FCOE DATA TRAFIC TO FABRIC SERVICES ENGINE 614
FABRIC SERVICES ENGINE FORWARDS 1st FCOE DATA TRAFFIC TO FCOE/FC CONVERTER 616
FCOE/FC CONVERTER SENDS 1st FC DATA TRAFFIC TO FC SWITCH IHS 618
FC SWITCH IHS SENDS 2nd FC TRAFFIC TO FCOE/FC CONVERTER 620
FCOE/FC CONVERTER SENDS 2nd FCOE DATA TRAFFIC TO FABRIC SERVICES 622
FABRIC SERVICES ENGINE FORWARDS 2nd FCOE DATA TRAFFIC TO CNA 624

FIG. 6

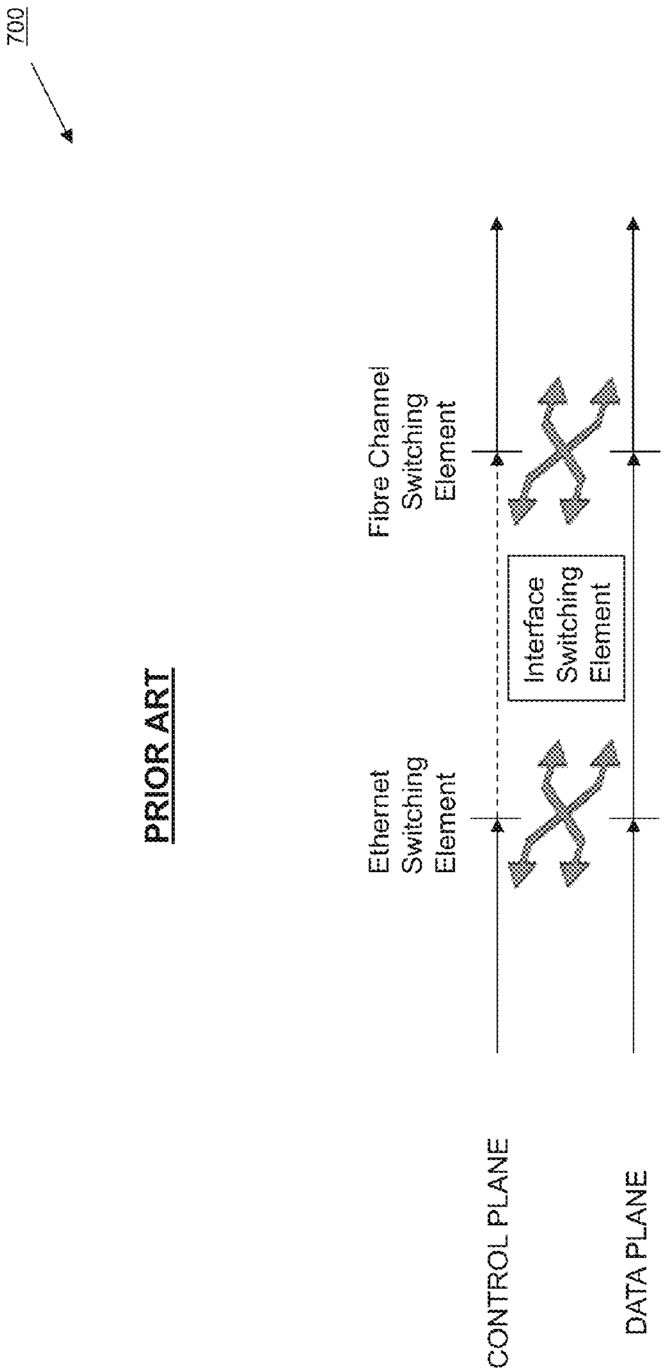

700
PRIOR ART
Ethernet Switching Element
Interface Switching Element
Fibre Channel Switching Element
CONTROL PLANE
DATA PLANE

FIG. 7a

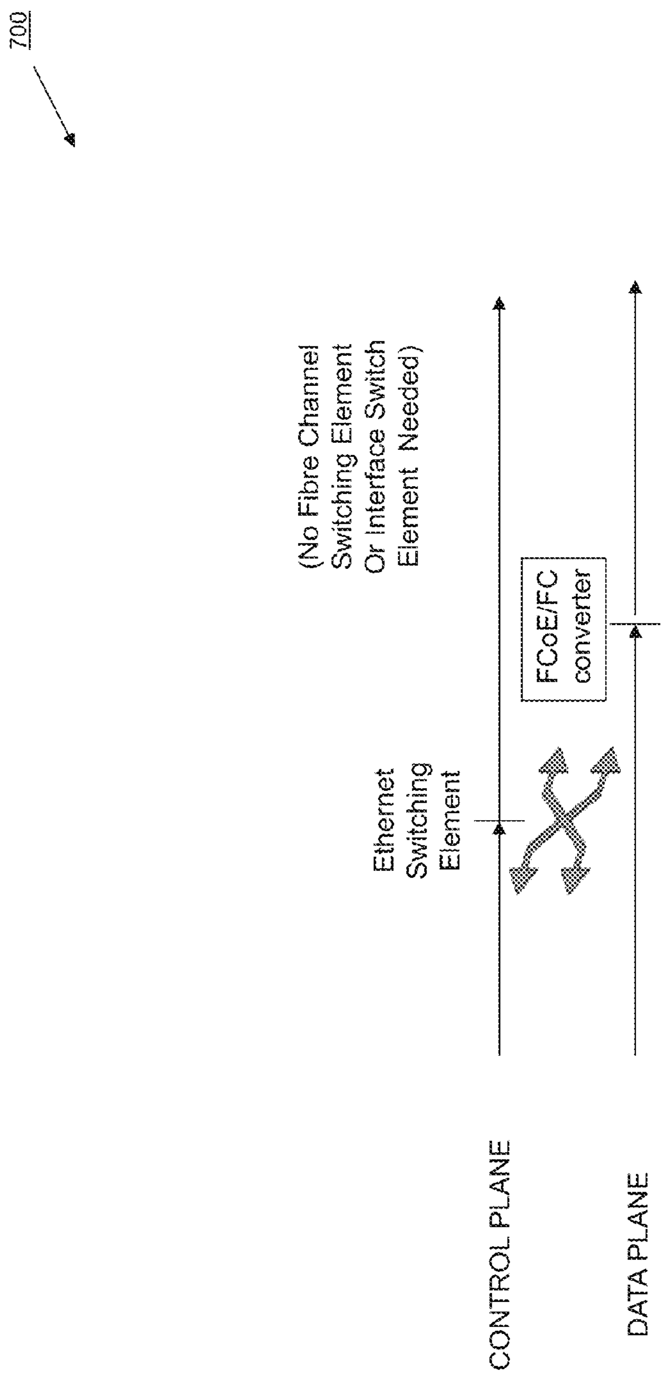

700
(No Fibre Channel Switching Element Or Interface Switch Element Needed)
Ethernet Switching Element
FCoE/FC converter
CONTROL PLANE
DATA PLANE

FIG. 7b

FIBRE CHANNEL GATEWAY SYSTEM

BACKGROUND

The present disclosure relates generally to information handling systems (IHSs), and more particularly to Fibre Channel gateway system for providing a direct Fibre Channel connection to a Fibre Channel storage area network.

As the value and use of information continues to increase, individuals and businesses seek additional ways to process and store information. One option is an information handling system (IHS). An IHS generally processes, compiles, stores, and/or communicates information or data for business, personal, or other purposes. Because technology and information handling needs and requirements may vary between different applications, IHSs may also vary regarding what information is handled, how the information is handled, how much information is processed, stored, or communicated, and how quickly and efficiently the information may be processed, stored, or communicated. The variations in IHSs allow for IHSs to be general or configured for a specific user or specific use such as financial transaction processing, airline reservations, enterprise data storage, or global communications. In addition, IHSs may include a variety of hardware and software components that may be configured to process, store, and communicate information and may include one or more computer systems, data storage systems, and networking systems.

Some IHSs including, for example, server IHSs such as blade servers, may be housed in a chassis enclosure such as, for example, the PowerEdge M1000e blade enclosure available from Dell Inc. of Round Rock, Tex. In some situations, it is desirable to connect those server IHSs to Fibre Channel storage area networks (SANs). Conventionally, converged network adapters on the server IHSs that utilize Fibre Channel over Ethernet (FCoE) communications must be connected to the SAN fabric via proprietary converged Ethernet switches and, in some cases, FCoE transit switches as well, both options of which suffer from a number of drawbacks.

Conventional proprietary converged Ethernet switches typically include an Ethernet switch Application Specific Integrated Circuit (ASIC) connected to a Fibre Channel switch ASIC by a connectivity Field Programmable Gate Array (FPGA). The Ethernet switch ASIC and the Fibre Channel switch ASIC must each be provided their own operating systems and must be configured with separate, different, and distinct command line interfaces. The use of two ASICs and an FPGA, along with other features of conventional proprietary converged Ethernet switches, increases the complexity and the cost of connecting the server IHSs to the SAN. Conventional FCoE transit switches provide a FCoE initialization protocol (FIP) snooping bridge or Front Side Bus (FSB) that does not provide native Fibre Channel at the chassis enclosure, still requires a converged Ethernet switch (such as those discussed above) with a Fibre Channel Forwarder (FCF) on the uplink ports, and introduce another hop in the FCoE path such that the system is subject to problems including head of line blocking, nondeterministic paths, nondeterministic impact of PAUSE/PFC across the PAUSE domains, and a variety of other multi-hop FCoe problems known in the art.

Accordingly, it would be desirable to provide an improved Fibre Channel gateway system.

SUMMARY

According to one embodiment, an information handling system (IHS) network includes a server IHS; a Fibre Channel (FC) switch IHS; and a FC gateway that is directly connected to each of the server IHS and the FC switch IHS, wherein the FC gateway is configured to: establish communication with the FC switch IHS; receive one of an FCoE Initialization Protocol (FIP) fabric login message and a FIP fabric discovery message from the server IHS and, in response, provide a FCoE fabric discovery message and convert the FCoE fabric discovery message to an FC fabric discovery message that is provided to the FC switch IHS; and receive a FC fabric discovery accept message from the FC switch IHS, convert the FC fabric discovery accept message to an FCoE fabric discovery accept message, and provide one of a FIP fabric login accept message and a FIP fabric discovery accept message to the server IHS.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic view illustrating an embodiment of an information handling system.

FIG. **2** is a schematic view illustrating an embodiment of a Fibre Channel Gateway System.

FIG. **3** is a flow chart illustrating an embodiment of a method for providing a Fibre Channel Gateway.

FIG. **4** is a flow chart illustrating an embodiment of a portion of the method for providing the Fibre Channel Gateway of FIG. **3**.

FIG. **5** is a flow chart illustrating an embodiment of a portion of the method for providing the Fibre Channel Gateway of FIG. **3**.

FIG. **6** is a flow chart illustrating an embodiment of a portion of the method for providing the Fibre Channel Gateway of FIG. **3**.

FIG. **7***a* is a schematic view of the handling of the control plane and the data plane in prior art systems and methods.

FIG. **7***b* is a schematic view of the handling of the control plane and the data plane in the systems and methods of the present disclosure.

DETAILED DESCRIPTION

For purposes of this disclosure, an IHS may include any instrumentality or aggregate of instrumentalities operable to compute, classify, process, transmit, receive, retrieve, originate, switch, store, display, manifest, detect, record, reproduce, handle, or utilize any form of information, intelligence, or data for business, scientific, control, entertainment, or other purposes. For example, an IHS may be a personal computer, a PDA, a consumer electronic device, a display device or monitor, a network server or storage device, a switch router or other network communication device, or any other suitable device and may vary in size, shape, performance, functionality, and price. The IHS may include memory, one or more processing resources such as a central processing unit (CPU) or hardware or software control logic. Additional components of the IHS may include one or more storage devices, one or more communications ports for communicating with external devices as well as various input and output (I/O) devices, such as a keyboard, a mouse, and a video display. The IHS may also include one or more buses operable to transmit communications between the various hardware components.

In one embodiment, IHS **100**, FIG. **1**, includes a processor **102**, which is connected to a bus **104**. Bus **104** serves as a connection between processor **102** and other components of IHS **100**. An input device **106** is coupled to processor **102** to provide input to processor **102**. Examples of input devices may include keyboards, touchscreens, pointing devices such as mouses, trackballs, and trackpads, and/or a variety of other input devices known in the art. Programs and data are stored on a mass storage device **108**, which is coupled to processor **102**. Examples of mass storage devices may include hard discs, optical disks, magneto-optical discs, solid-state storage devices, and/or a variety other mass storage devices known in the art. IHS **100** further includes a display **110**, which is coupled to processor **102** by a video controller **112**. A system memory **114** is coupled to processor **102** to provide the processor with fast storage to facilitate execution of computer programs by processor **102**. Examples of system memory may include random access memory (RAM) devices such as dynamic RAM (DRAM), synchronous DRAM (SDRAM), solid state memory devices, and/or a variety of other memory devices known in the art. In an embodiment, a chassis **116** houses some or all of the components of IHS **100**. It should be understood that other buses and intermediate circuits can be deployed between the components described above and processor **102** to facilitate interconnection between the components and the processor **102**.

Referring now to FIG. **2**, an embodiment of a Fibre Channel (FC) gateway system **200** is illustrated. The FC gateway system **200** includes an IHS enclosure **202** that houses a plurality of server IHSs **204**, **206**, and **208**. In an embodiment, the IHS enclosure **202** may be a PowerEdge M1000e blade enclosure available from Dell Inc. of Round Rock, Tex., and the server IHSs **204**, **206**, and **208** may be blade servers. However, a wide variety of different types of IHS enclosures and IHS's are envisioned as falling within the scope of the present disclosure. In the illustrated embodiment, each of the server IHSs **204**, **206**, and **208** includes a respective converged network adapter **204***a*, **206***a*, and **208***a*, that is directly connected to an FC gateway **210** that is further directly connected to an FC switch IHS **212** that is coupled to one or more FC devices **214**. In an embodiment, the direct connection of the server IHSs **204**, **208**, and **208** to the FC gateway **210** may be provided by an Ethernet cable directly connected to Ethernet ports on the server IHSs **204**, **206**, and **208** and Ethernet ports on the FC gateway **210**, an Ethernet connection through a backplane, and/or using a variety of other direct connection methods known in the art. While a direct connection between the server IHSs **204**, **206**, and **208** and the FC Gateway **210** operates to avoid a variety of Quality of Server (QoS) issues in the FC gateway system **200**, in other embodiment, the server IHSs **204**, **206**, and **208** may be connected to the FC Gateway **210** by one or more other components such as, for example, a switch IHS. In an embodiment, the direct connection of the FC gateway **210** and the FC switch IHS **212** may be provided by an FC cable directly connected to FC ports on the FC gateway **210** and FC ports on the FC switch IHS **212**, an FC connection through a backplane, and/or using a variety of other direct connection methods known in the art.

In an embodiment, the FC gateway **210** may be an Input/Output IHS that may include some or all of the components of the IHS **100** discussed above with reference to FIG. **1**. While illustrated as separate from the IHS enclosure **202** for clarity of illustration and discussion, in some embodiments, the FC gateway **210** may be located in the IHS enclosure **202**. In the illustrated embodiment, a memory system in the FC gateway **210** (e.g., the system memory **114** discussed above with reference to FIG. **1**) may include instructions that, when executed by a processing system (e.g., the processor **102** discussed above with reference to FIG. **1**), cause the processing system provide a fabric services engine **210***a* that is configured to perform any of the functionality of the fabric services engines discussed below. In some embodiments, the fabric services engine **210***a* may be referred to as an "essential" fabric services engine that provides for only the essential fabric services needed to enable the FC gateway **210**, which may include, for example, the sending of fabric discovery request messages to the login server (e.g., using Well Known Address—0xFF:FF:FE), the sending of fabric login request messages to the login server (e.g., using Well Known Address—0XFF:FF:FE), etc. However, in other embodiments, the fabric services engine **210***a* may provide any of a variety of fabric services known in the art. In one example, the processing system that provides the fabric services engine **210***a* may be an Ethernet switch chip, although other processing systems are envisioned as falling within the scope of the present disclosure. The fabric services engine **210***a* may be directly connected to each of the server IHSs **204**, **206**, and **208** through, for example, a connection between the processing system that provides the fabric services engine **210***a* and the converged network adapters **204***a*, **206***a*, and **208***a* in the server IHSs **204**, **206**, and **208**, respectively.

In the illustrated embodiment, the FC gateway **210** also includes a Fibre Channel over Ethernet/Fibre Channel (FCoE/FC) converter **210***b* that is connected to the fabric services engine **210***a*, and that is directly connected to the FC switch IHS **212**. In an embodiment, the FCoE/FC converter **210***b* may be provided on a physical layer (PHY) chip that is included on a plugin card that is removable from the FC gateway **210**. However, in other embodiments, the FCoE/FC converter **210***b* may be integrated into the FC gateway **210** such that it not (easily) removable or replaceable. In one example, the FCoE/FC converter **210***b* may include an FCoE/FC encapsulator/decapsulator at the PHY level, and as discussed in detail below may operate with the fabric services engine **210***a* to provide a direct, native FC N_Port Identity (ID) Visualization (NPIV) gateway uplink to a storage area network (SAN) **216** provided by, for example, the FC switch IHS **212** and the one or more FC devices **214**. As such, the FC gateway **210** may be referred to as an FC NPIV gateway in which multiple N_Port IDs share a single physical N_Port to allow multiple FC initiators to occupy a single physical port.

In an embodiment, the FC gateway **210** is programmed to handle FCoE Initialization Protocol (FIP) data traffic (also referred to below as FIP "messages"), FIP fabric login messages, FCoE data traffic between the server IHSs **204**, **206**, and **208** and the FC SAN **216**, and protocol translation that provides for the direct FC SAN uplink once initialization is complete. For example, the processing system (e.g., an Ethernet switch chip) that provides the fabric services engine **210***a* may include (e.g., be programmed with) learning programming such as, for example, layer **2** learning programming that allows the fabric services engine **210***a* to learn destination addresses, provide for pre-population of MAC addresses that correspond to FC Well Known Addresses (WKAs), etc. Furthermore, the processing system (e.g., an Ethernet switch chip) that provides the fabric services engine **210***a* may also include (e.g., be programmed with) all FC WKAs. Further still, the processing system (e.g., an Ethernet switch chip) that provides the fabric services engine **210***a* may also be programmed to create and handle the FCoE "wrapped" FC fabric login messages and accept messages as discussed below. Further still, a spoofed FC Forwarding (FCF) Media Access Control (MAC) address may be programmed into the FCoE/FC converter **210***b* source address with an algorithmic replacement rule that provides for the creation of Ethernet MAC addresses from FC source and/or destination addresses (FCIDs) and an FC map. The creation of Ethernet MAC addresses from FC source and/or destination addresses and an FC map using the FCoE/FC converter **210***b* provides for Ethernet forwarding on a standard Ethernet switch chip ("merchant" silicon) as opposed to a proprietary FC switch chip. While a few examples of the programming of the FC gateway **210** have been provided, one of skill in the art will recognize that other functionality discussed below may be programmed into the FC gateway **210** while remaining within the scope of the present disclosure. One of skill in the art in possession of the present disclosure will recognize that the FC gateway **210** provides a simpler, less expensive solution that is easier to configure and use than conventional converged Ethernet switches (sometimes in combination with FCoE transit switches), and when included in the IHS enclosure **202** provides for a direct, native FC NPIV gateway uplink from the back of the IHS enclosure **202** to the FC SAN **216**.

Referring now to FIG. **3**, an embodiment of a method **300** for providing an FC gateway is illustrated that may be performed using the FC gateway system **200** discussed above with reference to FIG. **2**. Each of the method blocks **400**, **500**, and **600** include several sub-blocks that are illustrated and described with reference to FIGS. **4**, **5**, and **6**, respectively. However, generally, the method **300** begins at block **400** where communications are established with the FC SAN, followed by block **500** where each server IHS is logged in, and then followed by block **600** where fc devices in the FC SAN are discovered.

Referring now to FIG. **4**, an embodiment of block **400** of the method **300** in which communication is established with the FC SAN is illustrated. Block **400** begins with sub-block **402** where the fabric services engine sends an FCoE fabric login to the FCoE/FC converter. In an embodiment, the method **300** and/or method block **400** may begin upon connection, power up, or other initialization of the fabric gateway system **200**, and following each upstream FC port on the FC gateway **210** completing initialization with the FC SAN **216** and informing the fabric services engine **210***a* that initialization is complete. In an embodiment of sub-block **402**, the fabric services engine **210***a* sends an FCoE fabric login message (e.g., an FCoE FLOGI) to the FCoE/FC converter **210***b* for each FC port on the FC gateway **210**. In an embodiment, the FCoE fabric login message sent at sub-block **402** includes a convention FC fabric login message wrapped in an FCoE header and trailer. In an embodiment, the fabric services engine **210***a* may use a spoofed FCF MAC address (which may have been previously programmed into the source address of the FCoE/FC converter **210***b* as discussed above) as its source address when communicating with the FCoE/FC converter **210***b* at sub-block **402** and other blocks and sub-blocks of the method **300** (e.g., a source MAC address F0:4D:A2:00:DE:XX, where XX designates a respective FC port on the FC gateway **210**). For example, the fabric services engine **210***a* may use a source MAC address F0:4D:A2:00:DE:01 for a first FCoE fabric login message provided for a first FC port on the FC gateway **210**, a source MAC address F0:4D:A2:00:DE:02 for a second FCoE fabric login message provided for a second FC port on the FC gateway **210**, and so on. In an example, the FCoE fabric login message may also include a destination MAC address (e.g., 0E:FC:00:FF:FF:FE that may include an FCoE Mapped Address Prefix (FCMAP) and a Login Server WKA that is programmed into the fabric services engine **210***a*), a System Identification (SID) (e.g., 00:00:00, an unassigned FC identification), and a Destination Identification (DID) (e.g., FF:FF:FE, the Login Server WKA).

Block **400** then proceeds to sub-block **404** where the FCoE/FC converter sends an FC fabric login to the FC switch IHS. In an embodiment, the FCoE/FC converter **210***b* receives the FCoE fabric login message from the fabric services engine **210***a* and converts it to an FC fabric login message (e.g., an FC FLOGI) that is sent to the FC switch IHS **212**. In an embodiment, the FCoE/FC converter **210***b* converts the FCoE fabric login message to an FC fabric login message by stripping the FCoE header and trailer from the FCoE fabric login message. In an example, the FC fabric login message may include the SID (e.g., **00**:**00**:**00**, an unassigned FC identification), and the DID (e.g., FF:FF:FE, the Login Server WKA).

Block **400** then proceeds to sub-block **406** where the FC Switch IHS sends an FC fabric login accept to the FCoE converter **210***b*. In an embodiment, the FC switch IHS **212** receives the FC fabric login message from the FCoE/FC converter **210***b* and, if that FC fabric login message is accepted, replies with an FC fabric login accept message (e.g., an FC FLOGI ACC) that is sent to the FCoE converter **210***b*. FC switch IHS actions to determine whether an FC fabric login message is accepted are known in the art and are not discussed in further detail here. In an example, the FC fabric login accept may include an SID (e.g., FF:FF:FE, the Login Server WKA), and a DID (e.g., 03:01:01, an assigned FC identification).

Block **400** then proceeds to sub-block **408** where the FCoE/FC converter sends an FCoE fabric login accept to the fabric services engine. In an embodiment, the FCoE/FC converter **210***b* receives the FC fabric login accept message from the FC switch IHS **212** and converts it to an FCoE fabric login accept message (e.g., an FCoE FLOGI ACC) that is sent to the fabric services engine **210***a*. In an embodiment, the FCoE/FC converter **210***b* converts the FC fabric login accept message to an FCoE fabric login accept message by wrapping the FC fabric login accept message in an FCoE header and trailer. In an example, the FCoE fabric login accept message may include a source MAC address (e.g., F0:4D:A2:00:DE:XX, the spoofed FCF MAC address used by the fabric services engine **210***a*, discussed above) that is added to the FCoE fabric login accept message by the algorithmic replacement in the FCoE/FC converter **210***b*, as discussed above. In an example, the FCoE fabric login accept message may also include a destination MAC address (e.g., 0E:FC:00:03:01:01, which may include a Fabric Provided MAC Address (FPMA), an FCMAP, and a DID FC identification) which may be added to the FCoE fabric login accept message by algorithmic replacement in the FCoE/FC converter **210***b*, as discussed above. In an example, the FCoE fabric login accept message may also include a SID (e.g., FF:FF:FE, the Login Server WKA) and a DID (e.g., 03:01:01, an assigned FC identification). In an embodiment, the FCoE fabric login accept message is trapped by hardware in the FC gateway **210** and sent the fabric services engine **210***a* at sub-block **408**.

Following sub-block **408** of block **400** of the method **300**, the FC gateway **210** has established communication with the FC SAN **216** (e.g., through the communications discussed above with the FC switch IHS **212**) and each of the upstream FC ports on the FC gateway **210** has logged in to the FC SAN **216**. The method **300** may then proceed to block **500** where the server IHS(s) **204**, **206**, and **208** are logged in through their associated converged network adapters **204***a*, **206***a*, and **208***a*.

Referring now to FIG. **5**, an embodiment of block **500** of the method **300** in which server IHS(s) are logged in is illustrated. One of skill in the art in possession of the present disclosure will recognize that block **500** allows the server IHS(s) **204**, **206**, and **208** to log into the FC switch IHS **212**, but will operate such that the server IHS(s) **204**, **206**, and **208** "believe" they are logging into a conventional FCF. Block **500** begins with sub-block **502** where a converged network adapter (CNA) sends an FIP Virtual Local Area Network (VLAN) request to the fabric services engine. Using the server IHS **204** and its associated CAN **204***a* as an example, in an embodiment, the CNA **204***a* sends an FIP VLAN request message to the fabric services engine **210***a*. In an example, the FIP VLAN request message may include a source MAC address (e.g., 00:01:02:03:04:05, A CNA ENode MAC address) and a destination MAC address (e.g., 01:10:18:01:00:02, an all-FCF-MAC-addresses address). In an embodiment, the FIP VLAN request message sent by the CNA **204***a* may be directed (or redirected) to the fabric services engine **210***a* based on its FIP Ethertype.

Block **500** then proceeds to sub-block **504** where the fabric services engine sends an FIP VLAN notification to the CNA. In an embodiment, the fabric services engine **210***a* receives the FIP VLAN request message from the CNA **204***a* and, in response, sends an FIP VLAN notification message to the CNA **204***a*, as is known in the art of FCoE FIP systems. In an embodiment, the fabric services engine **210***a* may use a spoofed FCF MAC address that previously programmed into the source address of the FCoE/FC converter **210***b* as its source address when communicating with the CNAs at sub-block **504** and other blocks and sub-blocks of the method **300** (e.g., a source MAC address F0:4D:A2:00:DE:XX, where XX designates the FC port on the FC gateway **210**). For example, the fabric services engine **210***a* may use the source MAC address F0:4D:A2:00:DE:01 for a first FIP VLAN notification message provided for a first FC port on the FC gateway **210**, the source MAC address F0:4D:A2:00:DE:02 for a second FIP VLAN notification message provided for a second FC port on the FC gateway **210**, and so on. In an example, the FIP VLAN notification message may include a destination MAC address (e.g., 00:01:02:03:04:05, the CNA ENode MAC address).

Block **500** then proceeds to sub-block **506** where the CNA sends an FIP discovery solicitation to the fabric services engine. In an embodiment, the CNA **204***a* sends an FIP discovery solicitation message to the fabric services engine **210***a* in response to receiving the FIP VLAN notification message at block **604**. In an example, the FIP discovery solicitation message may include a source MAC address (e.g., 00:01:02:03:04:05, the CNA ENode MAC address) and a destination MAC address (e.g., 01:10:18:01:00:02, an all-FCF-MAC-addresses address). In an embodiment, the FIP discovery solicitation message sent by the CNA **204***a* may be directed (or redirected) to the fabric services engine **210***a* based on its FIP Ethertype.

Block **500** then proceeds to sub-block **508** where the fabric services engine sends an FIP discovery advertisement response to solicitation to the CNA. In an embodiment, the fabric services engine **210***a* receives the FIP discovery solicitation message from the CNA **204***a* and, in response, sends an FIP discovery advertisement response to solicitation message to the CNA **204***a*, as is known in the art of FCoE FIP systems. In an embodiment, the fabric services engine **210***a* may use the spoofed FCF MAC address (e.g., F0:4D:A2:00:DE:XX, discussed above) as the source address for the FIP discovery response to solicitation message, and a destination MAC address (e.g., 00:01:02:03:04:05, the CNA ENode MAC address).

Block **500** then proceeds to sub-block **510** where the CNA sends one of an FIP fabric login or an FIP fabric discovery (e.g., an FIP FDISC) to the fabric services engine in response to receiving the FIP discovery advertisement response to solicitation. In an embodiment, the CNA **204***a* may send one of an FIP fabric login message or an FIP fabric discovery message to the fabric services engine **210***a* depending on whether the communication is the first login communication by the server IHS to the fabric services engine **210***a* (in which case a FIP fabric login message is sent) or the communication is any subsequent login communication by the server IHS to the fabric service engine **210***a* (in which case a FIP fabric discovery message is sent). In an example, the FIP fabric login message/FIP fabric discovery message may include a source MAC address (e.g., 00:01:02:03:04:05, the CNA ENode MAC address) and a destination MAC address that is the spoofed FCF MAC address provided by the fabric services engine **210***a* (e.g., F0:4D:A2:00:DE:XX, discussed above). In an embodiment, the FIP fabric login message/FIP fabric discovery message sent by the CNA **204***a* may be directed (or redirected) to the fabric services engine **210***a* based on its FIP Ethertype.

Block **500** then proceeds to sub-block **512** where the fabric services engine sends an FCoE fabric discovery to the FCoE/FC converter. In an embodiment, the fabric services engine **210***a* receives the FIP fabric login message/FIP fabric discovery message from the CNA **204***a* and, in response, sends an FCoE fabric discovery message to the FCoE/FC converter **210***b*. In an embodiment, the fabric services engine **210***a* converts the FIP fabric login message/FIP fabric discovery message into an FCoE fabric discovery message by, for example, copying the FC frame payload from the FIP fabric login message/FIP fabric discovery message, converting the extended link service command code to fabric discovery if it is provided in a fabric login format, regenerating a FC cyclic redundancy check (CRC) or checksum, and wrapping the resulting package in an FCoE header and trailer. In an example, the FCoE fabric discovery message includes a source MAC address (e.g., 00:01:02:03:04:05, the CNA ENode MAC address) and a destination MAC address (e.g., 0E:FC:00:FF:FF:FE, which may include an FCoE "wrapped" login server WKA).

Block **500** then proceeds to sub-block **514** where the FCoE/FC converter sends an FC fabric discovery to the FC switch IHS. In an embodiment, the FCoE/FC converter **210***b* receives the FCoE fabric discovery message from the fabric services engine **210***a* and, in response, converts the FCoE fabric discovery message to an FC fabric discovery message that is then sent to the FC switch IHS **212**. In an embodiment, the FCoE converter **210***b* converts the FCoE fabric discovery message to an FC fabric discovery message by stripping the FCoE header and trailer from the FCoE fabric discovery message. In an example, the FCoE fabric discovery message includes a SID (e.g., 00:00:00, an unassigned FC identification), and a DID (e.g., FF:FF:FE, the Login Server WKA).

Block **500** then proceeds to sub-block **516** where the FC Switch IHS sends an FC fabric discovery accept to the FCoE converter. In an embodiment, the FC switch IHS **212** receives the FC fabric discovery message from the FCoE/FC converter **210***b* and, if the FC fabric discovery message is valid, replies with an FC fabric discovery accept message (e.g., an FC FDISC ACC) that is sent to the FCoE converter **210***b*. FC switch IHS actions to determine whether an FC fabric discovery message is valid are known in the art and are not discussed in further detail here. In an example, the FC fabric discovery accept message may include the SID (e.g., FF:FF:FE, the Login Server WKA), and a DID (e.g., 03:01:01, the assigned FC identification for the CNA).

Block **500** then proceeds to sub-block **518** where the FCoE/FC converter sends an FCoE fabric discovery accept to the fabric services engine. In an embodiment, the FCoE/FC converter **210***b* receives the FC fabric discovery accept message from the FC switch IHS **212** and converts it to an FCoE fabric discovery accept message (e.g., an FCoE FDISC ACC) that is sent to the fabric services engine **210***a*. In an embodiment, the FCoE/FC converter **210***b* converts the FC fabric discovery accept message into an FCoE fabric discovery accept message by, for example, copying the FC frame payload from the FC fabric discovery accept message, and wrapping the FC frame payload in an FCoE header and trailer. In an example, the FCoE fabric discovery accept message may include the spoofed FCF MAC address used by the fabric services engine **210***a* (e.g., F0:4D:A2:00:DE:XX, discussed above) and a destination MAC address (e.g., 0E:FC:00:03:01:01, which may includes the CNA FPMA and a VN_Port MAC address) that are added by algorithmic replacement in the FCoE/FC converter **210***b*, as discussed above. In an embodiment, the FCoE fabric login accept message is trapped by hardware in the FC gateway **210** and sent the fabric services engine **210***a*.

Block **500** then proceeds to sub-block **520** where the fabric services engine sends one of an FIP fabric login accept or FIP fabric discovery accept to the CNA. In an embodiment, the fabric services engine **210***a* receives the FCoE fabric discovery accept message from the FCoE/FC converter **210***b* and, in response, may send one of an FIP fabric login accept message or an FIP fabric discovery accept message to the CNA **204***a* depending on whether a FIP fabric login message was received at block **510** (in which case a FIP fabric login accept message is sent) or a FIP fabric discovery message was received at block **510** (in which case a FIP fabric discovery accept message is sent. In an embodiment, the fabric services engine **210***a* converts the FCoE fabric discovery accept message into an FIP fabric login accept message/FIP fabric discovery accept message by, for example, copying the FC frame payload from the FCoE fabric discovery accept message, converting the extended link service command code to fabric login if it is provided in a fabric discovery format, regenerating a FC CRC or checksum, and wrapping the resulting package in an FCoE header and trailer. In an example, the FIP fabric login accept message/FIP fabric discovery accept message may include the spoofed FCF MAC address (e.g., F0:4D:A2:00:DE:XX, discussed above) as the source MAC address for the FIP fabric login accept message/FIP fabric discovery accept message and a destination MAC address (e.g., 00:01:02:03:04:05, the CNA ENode MAC address).

Block **500** of the method **300** may be performed for each server IHS **204**, **206**, and **208** by communicating with its respective CNA similarly as discussed above for the CNA **204***a* of the server IHS **204**. Following sub-block **520** of block **500** of the method **300**, each of the server IHSs are logged in through their associated converged network adapters **204***a*, **206***a*, and **208***a*, and the method **500** may proceed to block **600** where FC devices in the SAN are discovered. Furthermore, following block **520**, the FCoE/FC converter **210***b* is programmed to convert FCoE communications from the server IHSs **204**, **206**, and **208** to FC communications provided to the FC SAN **216**, and vice versa, e.g., using on the algorithmic replacement discussed above. In an embodiment, the FC devices are storage devices.

Referring now to FIG. **6**, an embodiment of block **600** of the method **300** in which FC devices in the SAN are discovered is illustrated. Block **600** begins with sub-block **602** where a CNA sends an FCoE name server port login to the fabric services engine. Using the server IHS **204** and its associated CNA **204***a* as an example, in an embodiment, the CNA **204***a* sends an FCoE name server port login message (e.g., an FCoE NS PLOGI) to the fabric services engine **210***a* in response to, for example, receiving the FIP fabric login accept message/FIP fabric discovery accept message. In an example, the FCoE name server port login message includes a source MAC address (e.g., 0E:FC:00:03:01:01, which may include the CNA FPMA and a VN_Port MAC address) and a destination MAC address that is the spoofed FCF MAC address used by the fabric services engine **210***a* (e.g., F0:4D:A2:00:DE:XX, discussed above).

Block **600** then proceeds to sub-block **604** where the fabric services engine forwards the FCoE name server port login to the FCoE/FC converter. In an embodiment, the fabric services engine **210***a* receives the FCoE name server port login message from the CNA **204***a* and, in response, forwards the FCoE name server port login message directly to the FCoE/FC converter **210***b*. Block **600** then proceeds to sub-block **606** where the FCoE/FC converter sends an FC port login to the FC switch IHS. In an embodiment, the FCoE/FC converter **210***b* receives the forwarded FCoE name server port login message from the fabric services engine **210***a* and, in response, converts the FCoE name server port login message to an FC port login message that is sent to the FC switch IHS **212** based on the programming of the FCoE/FC converter **210***b* as discussed above with reference to block **500**. In an example, the FC port login message includes an SID (e.g., 03:01:01, the assigned FC identification for the CNA), and a DID (e.g. FF:FF:FE, the Name Server WKA).

Block **600** then proceeds to sub-block **608** where the FC switch IHS sends an FC port login accept to the FCoE converter **210***b*. In an embodiment, the FC switch IHS **212** receives the FC port login message from the FCoE/FC converter **210***b* and, if the FC port login message is accepted, replies with an FC port login accept (e.g., an FC PLOGI ACC) that is sent to the FCoE converter **210***b*. In an example, the FC port login accept may include the SID (e.g., FF:FF:FE, the Name Server WKA), and a DID (e.g., 03:01:01, the assigned FC identification for the CNA).

Block **600** then proceeds to sub-block **610** where the FCoE/FC converter sends an FCoE name server port login accept to the fabric services engine. In an embodiment, the FCoE/FC converter **210***b* receives the FC port login accept message from the FC switch IHS **212** and, in response, converts the FC port login accept message based on the programming of the FCoE/FC converter **210***b* as discussed above with reference to block **500** to an FCoE name server port login accept message that is sent to the fabric services engine **210***a*. In an example, the FCoE name server port login accept message uses the spoofed FCF MAC address (e.g., F0:4D:A2:00:DE:XX, discussed above) as the source address and a destination address (e.g., 0E:FC:00:03:01:01, which may includes the CNA FPMA and a VN_Port MAC address) that are added by algorithmic replacement in the FCoE/FC converter **210***b*, as discussed above.

Block **600** then proceeds to sub-block **612** where the fabric services engine forwards the FCoE name server port login accept to the CNA. In an embodiment, the fabric services engine **210***a* receives the FCoE name server port login accept message from the FCoE/FC converter **201***a* and, in response, forwards the FCoE name server port login accept message directly to the CNA **204***a*. Following the forwarding of the FCoE name server port login accept message to the CNA **204***a*, one of skill in the art in possession of the present disclosure will recognize that other fabric services commands not explicitly discussed herein may be sent between the CNa **204***a* and the FC SAN **216** through the FCoE/FC converter **210***b* while remaining within the scope of the present disclosure.

Block **600** then proceeds to sub-block **614** where the CNA sends first FCoE data traffic to the fabric services engine. In an embodiment, the CNA **204***a* sends first FCoE data traffic to the fabric services engine **210***a*. In an example, the first FCoE data traffic includes a source address (e.g., 0E:FC:00:03:01:01, which may include the CNA FPMA and a VN_Port MAC address) and a destination address that is the spoofed FCF MAC address used by the fabric services engine **210***a* (e.g., F0:4D:A2:00:DE:XX, discussed above).

Block **600** then proceeds to sub-block **616** where the fabric services engine forwards the first FCoE data traffic to the FCoE/FC converter. In an embodiment, the fabric services engine **210***a* receives the first FCoE data traffic from the CNA **204***a* and, in response, forwards the first FCoE data traffic directly to the FCoE/FC converter **210***b*. Block **600** then proceeds to sub-block **618** where the FCoE/FC converter sends first FC data traffic to the FC switch IHS. In an embodiment, the FCoE/FC converter **210***b* receives the first FCoE data traffic from the fabric services engine **210***a* and, in response, converts the first FCoE data traffic to first FC data traffic based on the programming of the FCoE/FC converter **210***b* as discussed above with reference to block **500**, and that first FC data traffic is sent to the FC switch IHS **212**. In an example, the first FC data traffic includes an SID (e.g., 03:01:01, the assigned FC identification for the CNA), and a DID (e.g. 03:00:00, the FC identification of a target (e.g., an FC device **214** coupled to the FC switch IHS **212**)).

Block **600** then proceeds to sub-block **618** where the FC switch IHS sends second FC data traffic to the FCoE converter **210***b*. In an embodiment, the FC switch IHS **212** receives the first FC data traffic from the FCoE/FC converter **210***b*, forwards that first FC data traffic to the destination FC device **214** E.g., based on the DID in the first FC data traffic), and then receives second FC data traffic from that FC device **214** that is sent to the FCoE converter **210***b*. In an example, the second FC data traffic may include an SID (e.g., 03:00:00, the assigned FC identification for the CNA), and a DID (e.g. 03:01:01, the FC identification of a target).

Block **600** then proceeds to sub-block **620** where the FCoE/FC converter sends second FCoE data traffic to the fabric services engine. In an embodiment, the FCoE/FC converter **210***b* receives the second FC data traffic from the FC switch IHS **212** and, in response, converts the second FC data traffic to second FCoE data traffic based on the programming of the FCoE/FC converter **210***b* as discussed above with reference to block **500**, and that second FCoE data traffic is sent to the fabric services engine **210***a*. In an embodiment, the second FCoE data traffic includes the spoofed FCF MAC address used by the fabric services engine **210***a* (e.g., F0:4D:A2:00:DE:XX, discussed above) as the source MAC address and a destination MAC address (e.g., 0E:FC:00:03:01:01, which may include includes the CNA FPMA and a VN_Port MAC address) that are added by algorithmic replacement in the FCoE/FC converter **210***b*, as discussed above.

Block **600** then proceeds to sub-block **624** where the fabric services engine forwards the second FCoE data traffic to the CNA. In an embodiment, the fabric services engine **210***a* receives the second FCoE data traffic from the FCoE/FC converter **201***a* and, in response, forwards the second FCoE data traffic directly to the CNA **204***a*.

One of skill in the art will appreciate how blocks **400** and **500** of the method **300** provide for the processing of the control plane, while block **600** of the method **300** provides for the processing of the data plane. Referring to FIGS. **7***a* and **7***b*, the some differences between prior art methods for connecting server IHSs that use FCoE communications to SAN's that use FC communications and the systems and methods of the present disclosure are illustrated. FIG. **7***a* illustrates how, in prior art methods, the control plane and the data plane go through the same converged switch and FCF. FIG. **7***b* illustrates how, in the systems and methods of the present disclosure, the control plane is utilized to program an FCoE/FC converter to perform conversions such that a relatively simpler, faster, and cheaper switch chip (i.e., compared to the conventional systems discussed above) may be utilized for data processing on the data plane.

Thus, systems and methods have been described that provide a less complex and less expensive FC gateway that is configured to establish communication with an FC SAN, provide for the logging in of one or more server IHSs, and discover FC devices in the SAN so that the server IHSs may communicate with those FC devices. In some embodiments, the FC gateway provides an FC NPIV gateway in which all FIP traffic (e.g., VLAN request/notification, discovery solicitation/advertisement, FIP fabric login/fabric discovery, accepts, etc.) from server IHSs communicating using FCoE is handled by a fabric services engine that operates on the FC gateway and that also handles, for example, FIP FCoE link maintenance (e.g., FKA, discovery adjustment, CVL, FIP LOGO, etc.) In an embodiment, all FCoE communications may be passed through the FC NPIV gateway and have their FCoE headers stripped off on the way to the FCoE/FC encapsulator/decapsulator (i.e., converter) such that native FC communications are sent on to an upstream NPIV port on the FC SAN fabric. All incoming FC communications may be wrapped in an FCoE header by the fabric services engine and handled by a processing system (e.g., an Ethernet switch chip). In an embodiment, all FC fabric services (e.g., name server, management server, zoning, etc.) may be handled in the native FC SAN upstream from the FC gateway.

Although illustrative embodiments have been shown and described, a wide range of modification, change and substitution is contemplated in the foregoing disclosure and in some instances, some features of the embodiments may be employed without a corresponding use of other features. Accordingly, it is appropriate that the appended claims be construed broadly and in a manner consistent with the scope of the embodiments disclosed herein.

What is claimed is:

1. A Fibre Channel gateway, comprising:

a Fibre Channel over Ethernet/Fibre Channel (FCoE/FC) converter physical layer (PHY) chip that is programmed with a spoofed Fibre Channel Forwarding (FCF) Media Access Control (MAC) address;

a processing system that is coupled to the FCoE/FC converter PHY chip;

a memory system that is coupled to the processing system and that includes instructions that, when executed by the processing system, cause the processing system to provide a fabric services engine that is configured to:

establish communication with an FC switch IHS that is directly connected to the FCoE/FC converter PHY chip;

receive one of an FCoE Initialization Protocol (FIP) fabric login message and a FIP fabric discovery message that includes the spoofed FCF MAC address as its destination address from a server IHS and, in response, provide an FCoE fabric discovery message to the FCoE/FC converter PHY chip, wherein the FCoE/FC converter PHY chip converts the FCoE fabric discovery message to an FC fabric discovery message that is provided to the FC switch IHS; and

receive an FCoE fabric discovery accept message that includes the spoofed FCF MAC address as its source address from the FCoE/FC converter PHY chip and, in response, provide one of a FIP fabric login accept message and a FIP fabric discovery accept message that includes the spoofed FCF MAC address as its source address to the server IHS, wherein the FCoE/FC converter PHY chip converts an FC fabric discovery accept message that is received from the FC switch IHS to the FCoE fabric discovery accept message that is received by the fabric services engine.

2. The Fibre Channel gateway of claim **1**, wherein the instructions that, when executed by the processing system, cause the processing system to provide the fabric services engine that is configured to establish communication with the FC switch IHS further cause the fabric services engine to:

send an FCoE fabric login message to the FCoE/FC converter PHY chip such that the FCoE/FC converter PHY chip converts the FCoE fabric login message to an FC fabric login message that is provided to the FC switch IHS; and

receive an FCoE fabric login accept message from the FCoE converter, PHY chip, wherein the FCoE/FC converter PHY chip converts an FC fabric login accept message that is received from the FC switch IHS to the FCoE fabric login accept message that is received by the fabric services engine.

3. The Fibre Channel gateway of claim **1**, wherein the instructions, when executed by the processing system, cause the processing system to provide the fabric services engine that is further configured to:

receive a FIP Virtual Local Area Network (VLAN) request message from the server IHS and, in response, provide a FIP VLAN notification message to the server IHS; and

receive a FIP discovery solicitation message from the server IHS and, in response, provide a FIP discovery response to solicitation message to the server IHS.

4. The Fibre Channel gateway of claim **1**, wherein the instructions, when executed by the processing system, cause the processing system to provide the fabric services engine that is further configured to:

receive an FCoE name server port login message from the server IHS and, in response, forward the FCoE name server port login message to the FCoE/FC converter PHY chip such that the FCoE/FC converter PHY chip converts the FCoE name server port login message to an FC port login message that is provided to the FC switch IHS; and

forward an FCoE name server port login accept message to the server IHS that was received from the FCoE/FC converter PHY chip, wherein the FCoE/FC converter PHY chip converts an FC port login accept message that was received from the FC switch IHS to the FCoE name server port login accept message that is received by the fabric services engine.

5. The Fibre Channel gateway of claim **1**, wherein the instructions, when executed by the processing system, cause the processing system to provide the fabric services engine that is further configured to:

receive first FCoE data traffic from the server IHS and, in response, forward the first FCoE data traffic to the FCoE/FC converter PHY chip such that the FCoE/FC converter PHY chip converts the first FCoE data traffic to first FC data traffic that is provided to the FC switch IHS; and

forward second FCoE data traffic to the server IHS that was received from the FCoE/FC converter PHY chip, wherein the FCoE/FC converter PHY chip converts second FC data traffic that was received from the FC switch IHS to the second FCoE data traffic that is received by the fabric services engine.

6. The Fibre Channel gateway of claim **1**, wherein the fabric services engine includes at least one Well Known Addresses (WKA), and wherein the fabric services engine is configured to:

access the at least one WKA; and

use the WKA to communicate with the FC switch IHS.

7. An information handling system (IHS) network, comprising:

a server IHS;

a Fibre Channel (FC) switch IHS; and

a FC gateway that is directly connected to each of the server IHS and the FC switch IHS, wherein the FC gateway includes a physical layer (PHY) chip that is programmed with a spoofed Fibre Channel Forwarding (FCF) Media Access Control (MAC) address, and wherein the FC gateway is configured to:

establish communication with the FC switch IHS;

receive one of an FCoE Initialization Protocol (FIP) fabric login message and a FIP fabric discovery message that includes the spoofed FCF MAC address as its destination address from the server IHS;

generate an FCoE fabric discovery message;

use a PHY chip to convert the FCoE fabric discovery message to an FC fabric discovery message;

provide the FC fabric discovery message to the FC switch IHS;

receive a FC fabric discovery accept message from the FC switch IHS;

use the PHY chip to convert the FC fabric discovery accept message to an FCoE fabric discovery accept message that includes the spoofed FCF MAC address at its source address; and

provide one of a FIP fabric login accept message and a FIP fabric discovery accept message that includes the spoofed FCF MAC address as its source address to the server IHS.

8. The IHS network of claim **7**, wherein the FC gateway is configured to establish communication with the FC switch IHS by:

providing an FCoE fabric login message and converting the FCoE fabric login message to an FC fabric login message that is provided to the FC switch IHS; and

using the PHY chip to convert an FC fabric login accept message that is received from the FC switch IHS to an FCoE fabric login accept message.

9. The IHS network of claim **7**, wherein the FC gateway is configured to:

receive a FIP Virtual Local Area Network (VLAN) request message from the server IHS and, in response, provide a FIP VLAN notification message to the server IHS; and

receive a FIP discovery solicitation message from the server IHS and, in response, provide a FIP discovery response to solicitation message to the server IHS.

10. The IHS network of claim **7**, wherein the FC gateway is configured to:

receive an FCoE name server port login message from the server IHS and convert the FCoE name server port login message to an FC port login message that is provided to the FC switch IHS; and

use the PHY chip to convert an FC port login accept message that was received from the FC switch IHS to an FCoE name server port login accept message that is provided to the server IHS.

11. The IHS network of claim **7**, wherein the FC gateway is configured to:

receive first FCoE data traffic from the server IHS and convert the first FCoE data traffic to first FC data traffic that is provided to the FC switch IHS; and

use the PHY chip to convert second FC data traffic that is received from the FC switch IHS to second FCoE data traffic that is provided to the server IHS.

12. A method for providing a Fibre Channel gateway, comprising:

establishing communication with an FC switch IHS that is directly connected to an FCoE/FC converter physical layer (PHY) chip that is programmed with a spoofed Fibre Channel Forwarding (FCF) Media Access Control (MAC) address;

receiving one of an FCoE Initialization Protocol (FIP) fabric login message and a FIP fabric discovery message that includes the spoofed FCF MAC address as its destination address from a server IHS and, in response, providing an FCoE fabric discovery message to the FCoE/FC converter PHY chip, wherein the FCoE/FC converter PHY chip converts the FCoE fabric discovery message to an FC fabric discovery message that is provided to the FC switch IHS; and

receiving an FCoE fabric discovery accept message that includes the spoofed FCF MAC address as its source address from the FCoE/FC converter PHY chip and, in response, providing one of a FIP fabric login accept message and a FIP fabric discovery accept message that includes the spoofed FCF MAC address as its source address to the server IHS, wherein the FCoE/FC converter PHY chip converts an FC fabric discovery accept message that is received from the FC switch IHS to the FCoE fabric discovery accept message.

13. The method of claim **12**, wherein the establishing communications further comprises:

sending an FCoE fabric login message to the FCoE/FC converter PHY chip such that the FCoE/FC converter PHY chip converts the FCoE fabric login message to an FC fabric login message that is provided to the FC switch IHS; and

receiving an FCoE fabric login accept message from the FCoE converter PHY chip, wherein the FCoE/FC converter PHY chip converts an FC fabric login accept message that is received from the FC switch IHS to the FCoE fabric login accept message.

14. The method of claim **12**, further comprising:

receiving a FIP Virtual Local Area Network (VLAN) request message from the server IHS and, in response, provide a FIP VLAN notification message to the server IHS; and

receiving a FIP discovery solicitation message from the server IHS and, in response, provide a FIP discovery response to solicitation message to the server IHS.

15. The method of claim **12**, further comprising:

receiving an FCoE name server port login message from the server IHS and, in response, forwarding the FCoE name server port login message to the FCoE/FC converter PHY chip such that the FCoE/FC converter PHY chip converts the FCoE name server port login message to an FC port login message that is provided to the FC switch IHS; and

forwarding an FCoE name server port login accept message to the server IHS that was received from the FCoE/FC converter PHY chip, wherein the FCoE/FC converter PHY chip converts an FC port login accept message that was received from the FC switch IHS to the FCoE name server port login accept message.

16. The method of claim **12**, further comprising:

receiving first FCoE data traffic from the server IHS and, in response, forwarding the first FCoE data traffic to the FCoE/FC converter PHY chip such that the FCoE/FC converter PHY chip converts the first FCoE data traffic to first FC data traffic that is provided to the FC switch IHS; and

forwarding second FCoE data traffic to the server IHS that was received from the FCoE/FC converter PHY chip, wherein the FCoE/FC converter PHY chip converts second FC data traffic that was received from the FC switch IHS to the second FCoE data traffic.

17. The method of claim **12**, further comprising:

accessing a Well Known Address (WKA); and

using the WKA to communicate with the FC switch IHS.

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